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METHOD AND APPARATUS FOR
INTERACTIVELY DESIGNING CUSTOM, DECORATIVE STONework

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**METHOD AND APPARATUS FOR
INTERACTIVELY DESIGNING CUSTOM DECORATIVE STONEWORK**

CLAIM OF PRIORITY

5 This application claims priority from U.S. Provisional
Patent Application No. 60/449,493 entitled "METHOD AND
APPARATUS FOR STONEWORK CONSTRUCTION" by Carey, on February
21, 2003 (Attorney Docket No. STNL 2656000), and is related to
U.S. Patent Application Ser. No. ____, Attorney Docket No.
10 STNL 2656001, entitled "METHOD AND APPARATUS FOR PARAMETRIC
DESIGN OF CUSTOM DECORATIVE STONEWORK," filed on even date
herewith, and to U.S. Patent Application Ser. No. ____,
Attorney Docket No. STNL 2656002, entitled "METHOD AND
APPARATUS FOR CUSTOM MANUFACTURING OF DECORATIVE, CAST
15 STONEWORK," filed on even date herewith, the contents of which
are hereby incorporated by reference.

FIELD OF THE INVENTION

20 The present invention relates generally to interactively
designing custom decorative stonework.

DESCRIPTION OF THE RELATED ART

In the construction industry, decorative stonework has
been common feature for a number of years. Larger and larger

portions of stone are used in the construction of buildings and houses. Decorative stonework can be made by being cut from natural stone, cut from man-made materials, cast from molds, extruded or any combination of these techniques. Of
5 these techniques, one of the most economical is casting using molds. Generally speaking, casting the stonework allows the aesthetics associated with decorative stonework to be preserved while reducing the overall cost.

The process of manufacturing cast decorative stonework
10 typically involves pouring a limestone-based material into a mold and allowing it to harden. Once the material has hardened it is removed from the mold as a manufactured decorative stonework piece.

In some instances, a product may be formed of a single
15 piece. However, more typically, more complex products, such as door frames, are not molded out of one continuous piece of manufactured stone. Instead, several pieces are assembled, usually at the job site, to yield the structure. The molds, then, are usually for the smaller components of the large
20 whole product.

Architecture is a high art form that has been around since earliest days. The Romans and Greeks were master architects. These groups adopted certain stylistic features that were

associated with their architecture. In the traditional organizational scheme, architectural features are each given certain titles. For example, Doric, Ionic, and Corinthian columns are examples of Greco-Roman architectural features.

5 Doric columns are the least ornate of the three, having a plain shaft and a simple cap. Ionic columns are more ornate, having flutes caved into the shaft and a more ornate cap, such as scrolls. The Corinthian columns are the most ornate, usually with an extremely ornate cap. However, even through
10 these architectural features accurately describe the features of a structure, the average layperson may not be able to describe a Doric column, let alone know the name of the feature.

The customer is often a layperson and at the start of a
15 project may not even know specifically what feature he or she desires. In fact, most laypersons would typically have only a holistic knowledge or a feel for what he or she wants. Traditional organizational schemes, though, may not necessarily provide a logical correlation to the average
20 layperson.

To alleviate the problem associated with logical associations, it would be desirable to have a database organizational scheme can be employed to better assist a lay

customer or a professional in choosing the decorative stonework associated with desired architectural features.

Several problems exist with the design, manufacture, and assembly of manufactured decorative stonework. For a given
5 manufacturer of stone work, the molds can number in the tens of thousands. Changing the proportions of a given architectural feature can be cumbersome. There can be physical limitation as well as aesthetic considerations. Also, by changing the proportions of a given feature, the
10 molds utilized to make the parts that compose the given architectural feature may have to be changed. Compounding the complexity of this problem is the fact that most decorative stonework products are custom designed to fit an individual customer's tastes at the time a structure is designed. The
15 decorative stonework products must also meet size and structural requirements dictated by other, non-stonework products (such as a wooden entry door) or natural geographic features of the site. Thus, oftentimes, no two decorative stonework products will be exactly alike.

20 The parameters required for designing decorative stonework may not be known until the time a design for the entire structure is substantially complete. Nevertheless, decorative stonework must usually be incorporated into the design of a

structure at the concept stage or it may be impractical to add later. Thus, the ability to design decorative stonework products at a very early stage of the conceptualization of a structure extremely quickly, from sometimes incomplete
5 parameters, at least to the point that the appearance of the decorative stonework products in conjunction with the structure can be determined and the cost reliably estimated can be the difference between the structure ultimately including or not including any decorative stonework.

10 Decorative stonework is typically very heavy. It can also be prone to damage during transportation if not properly packaged or unnecessarily handled. Typically, it will not be possible to pre-assemble the components at the stonework manufacturer's facility to ensure proper fit. To maintain an
15 economical product, it is necessary to design and manufacture the components for the custom decorative stonework product, which may be one-of-a-kind, from tens of thousands of parts and their molds in an almost unlimited number of sizes, configurations and styles to fit with an unlimited number of
20 structural designs. Then, all the components and their supporting documentation must be transported to the job site in all the correct sizes and at the right time.

Therefore, there is a need for a method and/or apparatus

for facilitating and at least partially automating the process of selection, identification, design and manufacturing of custom decorative stonework products that at least addresses some of the problems associated with conventional methods and
5 apparatuses.

SUMMARY OF THE INVENTION

The present invention provides an apparatus for interactively designing custom, decorative stonework.
10 Included in the apparatus is a plurality of data modules. The plurality of data modules at least comprises an architectural pictures module, a units module, a parts module, and a profiles module. Also included in the application is a correlation module that is at least configured to map data
15 from the plurality of data modules. Additionally, a transfer protocol server is provided that allows access to a computer network. Finally, an application module is provided that is at least coupled to the transfer protocol server, coupled to the correlations module, and configured to interactively
20 design custom, decorative stonework.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the
5 accompanying drawings, in which:

FIGURE 1 is a block diagram depicting an improved organizational structure;

FIGURE 2 is a block diagram depicting a circle top doorway;

10 FIGURE 3 is a first example of a profile;

FIGURE 4 is a second example of a profile;

FIGURES 5a-5d are examples of units;

FIGURE 6 is a block diagram depicting the system for interactively designing custom, decorative stonework; and

15 FIGURES 7a and 7b depict a flow chart for interactively designing custom, decorative stonework.

DETAILED DESCRIPTION

In the following discussion, numerous specific details
20 are set forth to provide a thorough understanding of the present invention. However, those skilled in the art will appreciate that the present invention may be practiced without such specific details. In other instances, well-known

elements have been illustrated in schematic or block diagram form in order not to obscure the present invention in unnecessary detail.

Referring to FIGURE 1 of the drawings, the reference
5 numeral 100 generally designates an improved organizational structure. The improved organizational structure 100 comprises a unit description 102, part descriptions 104, and profile descriptions 106.

When either a professional or a customer begins the
10 process of choosing stonework, typically there is a first association to a specific item, such as a window. This first association is designated as a unit 102. The unit 102 can be either a very simple or a complex item ranging from a simple feature, such as a window frame, to more complex features,
15 such as gazebos and staircases.

As it is well known, decorative stonework products are often not composed of a single, continuously molded block. Instead, to maximize the ability to create numerous varieties of units 102 while attempting to minimize costs, individual
20 components or parts 104 are utilized. These parts are sometimes interchangeable and, thus, are capable of being used for a number of units. Furthermore, the parts 104 can be increased in size to create a large individual unit.

Therefore, in the improved organizational scheme 100, each unit 102 is subdivided into numerous parts 104. Some parts, however, are not properly interchangeable with other parts either for physical or for aesthetic reasons.

5 To increase the appeal of each of the units 100 and to include as many architectural styles as is possible, each part 104 has an associated profile 106. The profile 106 is typically a vertical or horizontal cross-sectional view of a given part 104. The shapes associated with crown molding are
10 one example of such a profile feature. With crown molding, a piece of wood or stonework is shaped to have curves or shapes on the surface. A cross-sectional view of the crown molding would be a profile. Also, profiles can also be overall views if the surface contains more intricate molded carvings, such
15 as carved leaves.

By creating the associative database, a lay customer or professional is more capable of choosing desired features in stonework. Instead of sorting through either pictures of buildings or of sets of architectural features, a customer or
20 professional can look through components or units 102 of a design scheme. By allowing a customer, specifically, to sort through the varieties of stonework available by unit 102, the attention of the customer will more likely be retained.

Preservation of a customer's attention clearly can preserve a possible sale that would provide a benefit to the customer and to the manufacturer/retailer.

Referring to FIGURE 2 of the drawings, the reference
5 numeral 200 generally designates an example of a unit. The unit comprises a first part 202, a second part 204, a third part 206, a fourth part 208, a fifth part 210, a sixth part 212, a seventh part 214, and an eighth part 216.

The unit 200 is an example of a stone circle top door
10 frame. The door frame of the unit 200 is not composed of a single, continuous piece of manufactured stone. Instead, the door frame of the unit 200 is composed of eight distinct parts 202, 204, 206, 208, 210, 212, 214, and 216. Each of the eight parts 202, 204, 206, 208, 210, 212, 214, and 216 can vary in
15 size depending on the dimensions of the door frame itself.

Moreover, the style of the door frame of the unit 200 can be changed by interchanging some parts. For example, if a customer chooses to have an eyebrow door frame instead of a circular door frame, as shown in FIGURE 2, then most of the
20 original parts can be retained. The difference between an eyebrow door frame and a circular door frame is the arc across the top of the frame. The top of the circular door frame has a radius equal to one half the distance between the sides of

the doorframe, whereas the top of an eyebrow doorframe is larger than the one half the distance between the sides of the doorframe. Therefore, it is possible to retain the third part 206, the fourth part 208, the fifth part 210, the sixth part 212, the seventh part 214, and the eighth part 216. Hence, the first part 202 and the second part 204 can be replaced with parts that possess a larger arc.

Providing the customer with an association as expressed can therefore lead to easier choosing of design elements. If circular door frames and eyebrow door frames are associated with different architectural styles, a customer may holistically know that he or she prefers an eyebrow door frame. However, if the customer has a particular affinity for an architectural style that does not incorporate eyebrow door frames, then a customer can become frustrated because he or she does not know the name of the particular style of door frame or the specific architectural style to which the door frame belongs. Hence, organization of stonework into units, such as the door frame of unit 200, can assist the customer.

FIGURES 3 and 4 are examples of profiles. Both the first profile 300 and the second profile 400 are horizontal cross-sections of a given part. The dimensions of each profile 300 and 400 are typically measured by three dimensions. The

height Y, the upper depth X and the lower depth Z are related to the overall size of the given part 104. There are profiles that can be utilized in order to provide varying degrees of aesthetic flair.

5 FIGURES 5a-5d are examples of units. FIG. 5a depicts an unfluted Corinthian column, and FIG. 5c depicts an unfluted Doric column. Specifically, the picture of FIGS. 5a and 5c only depict the caps of each of the respective columns because the caps are what differentiate the Corinthian column from the
10 Doric column.

FIGURES 5b and 5d, on the other hand, depict more complex units. Specifically, each of the respective pictures depicts an entryway. FIG. 5b is denoted as a "Castile Aragon II" that is a style of architecture common to the Aragon region of
15 Northeast Spain. FIG. 5d is denoted as "Boxwood Manor" that is a style of architecture more indicative of the Southwest United States.

Referring to FIGURE 6 of the drawings, the reference numeral 600 generally designates the system for interactively
20 designing custom, decorative stonework. The system 600 comprises a correlation module 102, an architectural pictures module 604, a units module 606, a parts module 606, a profiles module 610, a Computer Aided Design (CAD) drawings module 612,

a costs module 614, an application module 616, a drawing production module 622, a cost estimator module 620, a Hyper Text Transfer Protocol (HTTP) server, and a computer network 644.

5 The system 200 is based on user access through the computer network 644. A user terminal (not shown) utilizes the computer network 644 to gain access to the HTTP server 618. The computer network can be a variety of networks including, but not limited to, the Internet. The computer
10 network 618 is coupled to the HTTP server 618 through a first communication channel 646.

Once a user has gained access to the HTTP server 618, the HTTP server 618 is then able to utilize the application module 616. The HTTP server 618 is coupled to the application module
15 616 through a second communication channel 640. The application module is the module that provides interactive selection for designing custom, decorative stonework.

However, in order for the application module to function, the application module should access a series of other
20 modules. The application module 616 is coupled to the cost estimator module 620, the drawing production module 622, and the correlation module 602 through a third communication channel 642, a fourth communication channel 636, and a fifth

communication module 638, respectively. The correlation module 602 provides the pictures and correlations for a user to select. Based on the information selected from the correlation module 602, the cost estimator module 620 can
5 calculate an estimated cost of a job incorporating custom, decorative stonework, and the drawing production module 622 provides drawings of all of the selected features incorporated into a single drawing or into a plurality of drawings.

In order for the correlation module 602 to provide the
10 information necessary for the application to function, though, the correlation module 602 utilizes a plurality of other modules. The correlation module 602 is coupled to the architectural pictures module 604, the units module 606, the parts module 608, the profiles module 610, the CAD drawings
15 module 612, and the costs module 614 through a sixth communication channel 624, a seventh communication channel 626, an eighth communication channel 628, a ninth communication channel 630, a tenth communication channel 632, and an eleventh communication channel 634, respectively. The
20 correlation module 602 determines relationships between certain architectural features illustrated in the architectural pictures to units, part, costs, and so forth. Then, the correlation module 602 can relay the information to

the application module 616 that stores the selections and tracks the costs automatically.

The system includes a static documents display filter which enables the system to dynamically alter the text and
5 images displayed for a particular user and stage of project. Images and text are organized for mapping to display pages associated with the intent of the particular user at the particular stage of the project. For example, the intent of the user at a concept stage is to extract and display "higher
10 level" information, such as overall views of units, rather than each and every detail of every part. By contrast, at the design stage, the user will typically intend to extract and display more detailed information and images, showing all the intricate aesthetic features of each part and all dimensions
15 required for building design. Still further, once the project has been designed, a user employed by the stonework manufacturer can extract and display text and images required for actual manufacturing and shipping, such as which molds or tools are required, the location of the molds are tools and
20 when they will be available, the material to be used, coloration, the processing steps required, shipment location and dates, and billing information. The types of text and images displayed to the user depend upon input from the user

as to the status of the user, which can include statuses such as a customer building a house, an architect, a building contractor, a project manager at the stonework manufacturer). The types of text and images displayed can also include the
5 stage of the project, such as whether the project is at the concept stage, estimating stage, bidding stage, design stage, manufacturing stage or shipping stage. Accordingly, each user can display type and level of detail of the text and images most suited to the user's need for information at that
10 particular stage of the project.

Referring to FIGURES 7a and 7b of the drawings, the reference numeral 700 generally designates a flow chart for interactively designing custom, decorative stonework.

The process of interactively designing custom, decorative
15 stonework begins with a user accessing an application in step 702. A user can either access the application locally or remotely through a computer network, such as the computer network 644 of FIGURE 6. The application can also be either a text based system, such as Simulated Program with Integrated
20 Circuit Emphasis (SPICE), or contain a graphical user interface. However, having a graphical user interface would be more advantageous because of the simplicity of use among a great variety of users.

Once the user has accessed the application, then the user can select an architectural picture in step 704. By having a user select an architectural picture, a user can effectively browse architectural features without having any knowledge of
5 either architecture or the nomenclature associated therewith. A user can then choose architectural features that are found to be aesthetically pleasing.

Once the architectural picture has been selected, then all of the corresponding data relating to the picture are
10 mapped. In step 706, the units are mapped to the picture. In step 708, the parts are mapped to the picture, and in step 710, the profiles are mapped to the picture. In each case of the mapping, a correlation unit, such as the correlation unit 602 of FIGURE 6, provides the mapping or correlation of data
15 from a variety of databases or modules.

The user is then allowed to interactively select features of the architectural picture in step 712, once the architectural picture has been mapped. The interactive selection allows a user to move the cursor onto architectural
20 features of the architectural picture that have been mapped. As the user moves the cursor across the picture, the application can identify those features that have been mapped. There are a variety of manners to identify the mapped

features, such as outlining or highlighting. Moreover, a cursor can be moved across a picture through the use of a mouse, a keyboard, or another peripheral device.

Additionally, the user can request definitions of certain architectural features in step 714 or add the features to a list of selected items in step 716. These requests are performed by using the keys on a mouse pad, keys on a keyboard, or selection means of a another peripheral device. If a user requests a definition, then the definition is mapped to the unit or part selected that is associated with the architectural feature in step 718. The definition is then displayed in step 720. Once displayed, a user can then select the feature to be added to a specification in step 716. Also, a feature can be selected without requesting a definition in step 716. Once selected, the feature is added to the specification in step 722. However, if the architectural feature is not selected, then the user is allowed to continue to interactively select features in step 712.

However, once a feature is selected, then the dimensions can be varied in step 723. The process of adjusting the dimensions of a feature can be accomplished by employing a plurality of parametric equations and menus. Such an adjustment mechanism is disclosed in more detail in a

co-pending U.S. Patent Application No. _____ entitled
"METHOD AND APPARATUS FOR PARAMETRIC DESIGN OF CUSTOM
DECORATIVE STONEWORK" by Carey, filed one even date herewith
(Attorney Docket No. STNL 2656001), the contents of which are
5 is hereby incorporated by reference.

Once a user has selected a feature and the dimensions
have been entered, the user is prompted if the usage of the
chosen architectural picture is complete in step 724. If the
user has not completed the usage of the architectural picture,
10 the user is allowed to continue to interactively select other
features in step 712. However, if the user has completed the
usage of the architectural picture, then the user is prompted
as to whether the session is complete in step 726. If the
user has not completed the session, then the user is allowed
15 to select another architectural picture in step 704.

Once a user is satisfied that all of the desired features
have been selected from an architectural picture, though, the
application then begins to assemble the final products. The
costs and the CAD drawings are mapped to the current
20 selections in the specification in step 728 and in step 730,
respectively. A drawing of the specification is then made in
step 732. Once all of the information has been compiled, then

the cost estimate and specification are presented to the user in step 734.

In many instances, a user will not know all of the relevant parameters at an early stage of the design process.

5 For example, a user may know that 10 foot high columns are desired, but not whether a Doric or a Corinthian style will be used. Alternatively, a user may know that Doric columns will be used, but not whether the columns will be 8 feet, 10 inches high. In such cases, the systems stores and processes
10 whatever data is input and will output a range of costs for the included possibility configurations. Thus, based on the amount of selections made by a user, a range of costs is typically yielded to at least allow a user to obtain a general sense of the cost involved.

15 After the specification and the costs have been presented, the user can then request a bid in step 736. If there has been a bid request, then the bid is forwarded to the business unit in step 738. It should be noted that, even if the data is incomplete, the system can still prepare a bid.
20 However, in such a case, the bid will give different price ranges for each of the possible configurations. Otherwise, the user is allowed to continue to interactively select features in step 704.

Of course, before the stonework can actually be made or taken from inventory, the data should be fully specified. However, once the missing data is supplied the system uses the data to generate a specification, CAD drawings, and parts
5 lists for the project. Once such specifications and parts lists are complete, the required stonework pieces for the project be readily made or taken from inventory.

Referring to FIGURE 8 of the drawings, the reference numeral 800 generally designates an example of the operation
10 of the system for interactively designing custom, decorative stonework. The operational example 800 comprises a architectural picture 802, a unit 804, a part 806, and a CAD drawing of the part 812.

The architectural picture 802 is first chosen by a user.
15 In the case of the operational example 800, the picture 802 is a Virginia Estate. The notion of a Virginia Estate has a tendency to resonate with user more so than typical architectural titles. A Virginia Estate brings to mind such edifices as Thomas Jefferson's Monticello. Therefore, the
20 system 600 of FIGURE 6 is easier to use.

Once an architectural picture 802 has been chosen, the user then can select one of the units 804 that comprises the building depicted in the picture 802 in step 808. The unit

804 is a doorway that incorporates several pieces of decorative stonework. Within the unit 804, a user can then select one of the parts that comprise the unit 804 in step 810. Specifically, for the purposes of illustration, the part
5 806 is a key entitled a "Batman Recess 14A" has been chosen. Most users may not have known to look for this specific unit 804 as a "Batman Recess 14A," but choosing the unit 804 from an architectural picture is more strait-forward.

Once a part 806 has been selected, a CAD drawing of the
10 part 806 can be chosen in step 814. The CAD drawing 812 has specific dimensions for the part 806 as well as all of the specific technical layouts. If an adjustment unit exists, then the sizes may even be adjusted.

By providing easily usable software to enable either a
15 laymen or more sophisticated professional to choose custom stonework, the economic benefits are substantial. The systems and software allow a user to use graphical interfaces to easily select entire architectural features, like window frames, that are to be custom made of manufactured stone. A
20 user does not need to have knowledge of architecture or the nomenclature associated with architectural features. An application then can track selections and determine cost estimates. The entire process, though, is automated. There

is no need for a cost estimator (person), an architect (person), and so forth. Therefore, by reducing the requirement of having many skill persons employed to provide cost estimates and drawings, the costs are greatly reduced, and the time from project conceptualization to contract signing is greatly reduced. An example of an embodiment of the invention is further described in Appendices A to M, the contents of which are hereby incorporated by reference.

It is understood that the present invention can take many forms and embodiments. Accordingly, several variations may be made in the foregoing without departing from the spirit or the scope of the invention. The capabilities outlined herein allow for the possibility of a variety of programming models. This disclosure should not be read as preferring any particular programming model, but is instead directed to the underlying mechanisms on which these programming models can be built.

Having thus described the present invention by reference to certain of its preferred embodiments, it is noted that the embodiments disclosed are illustrative rather than limiting in nature and that a wide range of variations, modifications, changes, and substitutions are contemplated in the foregoing disclosure and, in some instances, some features of the

present invention may be employed without a corresponding use of the other features. Many such variations and modifications may be considered desirable by those skilled in the art based upon a review of the foregoing description of preferred
5 embodiments. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the scope of the invention.